The Social Aspects of Innovation

Interview by Karen Christensen

You have studied the ways in which innovation is contingent upon social structures. What are some of your key findings?

First off, it's worth noting that this stream of research constitutes a radical departure from the traditional heroic, 'great man' view of innovation. From **Alexander Graham Bell** to **Thomas Edison** — right up to contemporary examples like **Steve Jobs** — innovation has been closely associated with 'rare gifted visionaries', who see the future in ways most people cannot. But innovation doesn't occur in a vacuum: we forget that Bell had **Thomas Watson**, Edison had a lab, and Jobs had **Wozniak**, **Ive** and others.

Too often, we neglect the *social milieu* within which innovation is cultivated — the concrete, ongoing, everyday interactions inventors have with their colleagues. This ecosystem is what provides the raw ingredients for innovation, and there is order to it: there are patterns to the interactions, and by recording them — for instance, who goes to whom for information, advice, problem solving, friendship, etc.? — we can construct a 'map' that represents the 'collective intelligence system' of an organization.

It turns out that such maps tell us some very important things about the dynamics of innovation. I've been conducting this research with Professors **Ray Reagans** (MIT) and **Marco Tortoriello** (IESE), and we have found that innovation is truly a collective endeavour. While not dismissing individual intelligence and effort, the way you are connected to others also matters. We have also learned that there is tremendous variation across individuals in terms of how they are connected to their colleagues, and that there is not just one type of 'optimal network' for innovation. Instead, there are several distinct features of networks that describe the different positions that individuals occupy, and each matters in different ways. My co-authors and I are painting a very different picture of innovation: rather than being the province of brilliant savants, we are showing that it is deeply and inextricably embedded in networks of social relationships.

How do you define 'brokerage' and 'closure' in networks, and how do they relate to innovation?

These are two of the most important concepts in our research, and interestingly, they have also been shown to be of critical importance in a diverse array of other academic fields — from Astrophysics to Genetics to Neuroscience. In simplest terms, the concept of brokerage describes 'being positioned in a network such that you are in between two other people who are not themselves directly (or indirectly) connected'. In network terms, we refer to this as a 'bridging tie'. If the only way for me to reach one of your contacts is through you, you are a broker, and your ties to me and your other contact are 'bridges' in the network.

Bridges are extremely important, because they are conduits through which information and resources travel between parts of a network that are otherwise unable to interact. The broker who sits at the intersection of the bridge occupies a strategic location, because she has a relatively unique view over the rest of the network that no one else enjoys: she is privy to the information, ideas, trends, discoveries and opportunities that are circulating in my part of the network, and at the same time, she is able to access the same type of resources from her other contact(s). These contacts and I do not enjoy that same privileged access: we do not know what each other knows, except to the extent that the broker passes along information.

As a result, brokers may see patterns that others don't, and sense trends and opportunities sooner than others. They also have more opportunities to put unrelated ideas together. From a strategic perspective, they can act as a filter that determines what, if anything, people in one part of the network know and understand about people in other parts of the network. However, being a broker is not all good: there are costs involved in investing in learning about different technological and functional areas, translating ideas, interacting with people who have very different languages, customs and traditions, and dealing with conflicting pressures and demands from people whose priorities, goals and preferences diverge.

The concept of *closure* is the polar opposite of brokerage. It boils down to two people who are connected to each other, and who are both also connected to one or more of the same other people in the network. In network terminology, these same other people are known as 'mutual third parties', and the network position of closure is identified by a 'closed triad' consisting of three people who all have ties to each other. In closed networks, information circulates rapidly: everyone knows what everyone else knows relatively quickly, and as a result, it is relatively easy to coordinate with others, to calibrate expectations, and to validate the accuracy of information about not only 'who knows what', but critically, who *did* what.

In closed networks, norms and reputation take on heightened importance. What constitutes 'good' and 'bad' behaviour is less a matter of personal opinion, and more a matter of what the network defines as being in everyone's collective best interest. Moreover, the circulation of gossip about who did (or did not) do what to whom is rapid, making one's reputation a particularly potent force. When you do a favour for me, word of your helpfulness often extends to our mutual third parties — as does your displeasure with me, should I decline to reciprocate. So, my decision about how cooperative and responsive to be towards you takes on the added dimension of how my behaviour will be viewed by others. As a result, there is a pronounced tendency towards cooperation in networks that are characterized by closure.

How does the network position of a particular individual contribute to their innovativeness?

This is the question professor Reagans and I set out to address when we embarked on what has become a 15-year research program. Our approach has been to view innovation in organizations as being grounded in learning and knowledge sharing. Before we began, the few existing studies had primarily focused on the type of ties that people had ('strong' versus 'weak'), with the presumption that 'type of
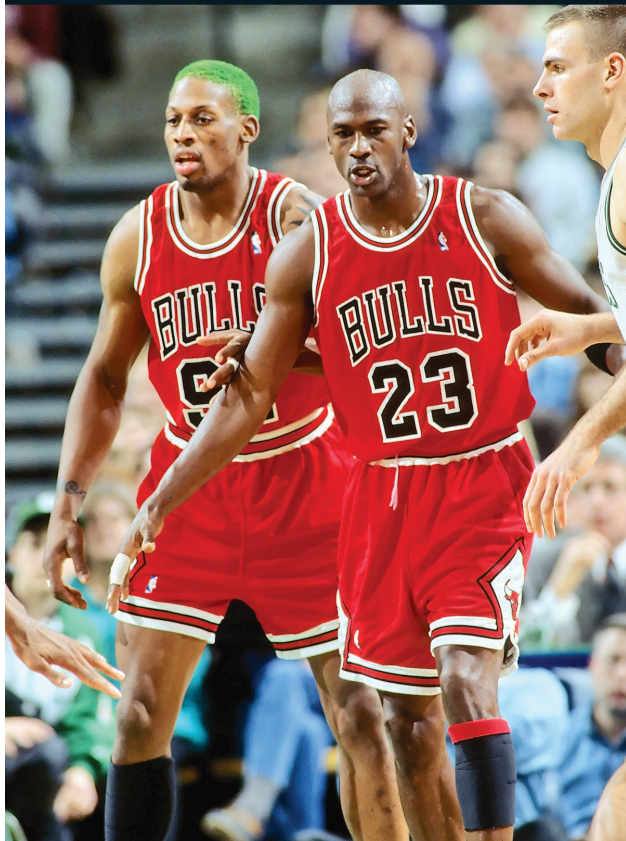
Dennis Rodman, Catalyst, with Michael Jordan, Innovator.

ties' is a good approximation of 'type of network'. We were able to show that that is not necessarily the case — and that the network positions of brokerage and closure have separate and independent effects. The crucial question was, In what distinct ways do brokerage and closure affect learning and knowledge sharing?

Given their seemingly-opposing configurations, it was widely believed that brokerage and closure would have opposing effects on learning and knowledge sharing, but the literature was divided on which would be positive and which would be negative. Interestingly, our results showed that *both* are conducive to learning and knowledge sharing — but in different ways. The benefit of brokerage is being able to access diverse knowledge, broaden your own knowledge base, and learn how to translate new knowledge into a language that others can understand and appreciate. Brokers are exposed to greater opportunities to make novel combinations across distinct pools of knowledge and, as indicated, often acquire the critical skill of relating something new to something that is well known.

On the other hand, the benefit of *closure* is the greater willingness of individuals to cooperate with each other.

Knowledge sharing constitutes a 'discretionary favour' by the sender on behalf of the recipient. Specifically, the sender takes time out from her own activities to explain to the receiver something that may allow the receiver to solve a problem or advance their own work. The favour is discretionary in the sense that we often decide for ourselves whether to pass on knowledge, respond to requests for information, elaborate on nuances, or illustrate how to apply a concept. We have found that people in closed networks are more likely to undertake such activities.

Our findings indicate that brokerage and closure are not necessarily in opposition. The trade-off between the two depends on how you define the network. If you introduce two of your contacts that previously did not know each other, you have increased the level of closure in your network while at the same time, decreasing the level of brokerage in the network. Yet, if you introduce a new hire to everyone on your team — but that new hire doesn't know any of your contacts in the rest of the organization — the level of closure on the team has increased, and your level of brokerage in the rest of the organization has also increased.

In your latest work, you focused on a particular role in the innovation process. How do you define a 'catalyst' of innovation?

If innovation is not all about lone inventors, then what other roles matter? This is the question that led Prof. Tortoriello and I, along with Carnegie Mellon's **David Krackhardt**, to develop the notion of *catalysts*. We think of catalysts as the 'helpers' who are often hidden in the shadows of star inventors — but who nonetheless perform an essential role in the innovation process. Analogies in the sports arena would include basketball player **Dennis Rodman,** whose presence on the court increased the scoring of **Michael Jordan**, but who was not a high scorer himself; the hockey player **Adam Oates**, who is #6 in all-time assists, but #146 in all-time goals; and soccer player **Cesc Fàbregas**, who is #1 in all-time assists, but #128 in all-time goals. Catalysts usually

Most innovators are not catalysts, and most catalysts are not innovators.

don't create innovations of their own, but they provide key inputs and assistance to those who do. Some individuals do a bit of innovating and a bit of catalyzing, but most innovators are not catalysts, and vice versa.

This indicates that these roles involve rather distinct activities: whereas innovators are drawing on their network of contacts to access diverse ideas, then translating that into novel outputs, catalysts are more likely to 'feed' useful ideas to their contacts to enable others to produce creative outputs. The catalyst's 'job', then, is to know their contacts well — what their areas of expertise are, what their priorities are — and to be on the lookout for knowledge that is relevant and useful to them.

Describe the role of knowledge diversity in all of this.
Knowledge diversity is a basic ingredient in innovation, because it increases opportunities for novel combinations. Knowledge acquired from sources external to the organization is a key source of such knowledge, which is why, not surprisingly, internalizing external knowledge is a key priority for so many research-intensive organizations. The more diverse your organization's knowledge base is, the more readily it can learn about related areas; yet the more diverse the knowledge base is, the more dispersed across specialized groups it can become — making it increasingly difficult for those possessing diverse knowledge to integrate it.

This is where catalysts come in. A big part of what makes them effective is having contacts that possess diverse knowledge. They tend to have a keen sense of not only who knows what, but also, who needs what? Both types of awareness stem from the catalyst's position in closed networks, which tend to involve frequent and repeated interactions among mutually connected contacts. This fosters the development of a 'shared language', common understanding, and the identification of areas of expertise.

How do you define 'Model-Based Problem Solving', and how does it relate to your work?
I would define it as, 'A systematic way to answer the question, Why?, guided by a theory of cause(s) and validated with relevant data and robust analysis'. Having started my career at Carnegie Mellon, I became steeped in what is known as 'the Carnegie School tradition' of organizational research. A key tenet of the approach is that organizations are far from perfect, rational constructions, but rather, works-in-progress that are better understood as 'adaptive learning systems'. Professor Reagans and I — who had deep expertise in social network analysis—saw a number of parallels between the learning- and network-based views of organizations, and we became interested in the question of why there are differences in knowledge flows across organizations.

Network theory provided us with a novel way of conceptualizing and studying learning in organizations that identified distinct causal mechanisms rooted in social context and associated with different network positions. The network literature also provided us with a sophisticated methodology specifically developed for mapping and analyzing networks based on relational data. By taking this systematic, model-based approach, our research not only added to our understanding of learning, knowledge sharing and innovation in organizations, it helped create the foundation and infrastructure for a program of research that is now being pursued by a community of researchers around the world. **RM**

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